



Progress in Sustainably Achieving Low Nutrient Levels

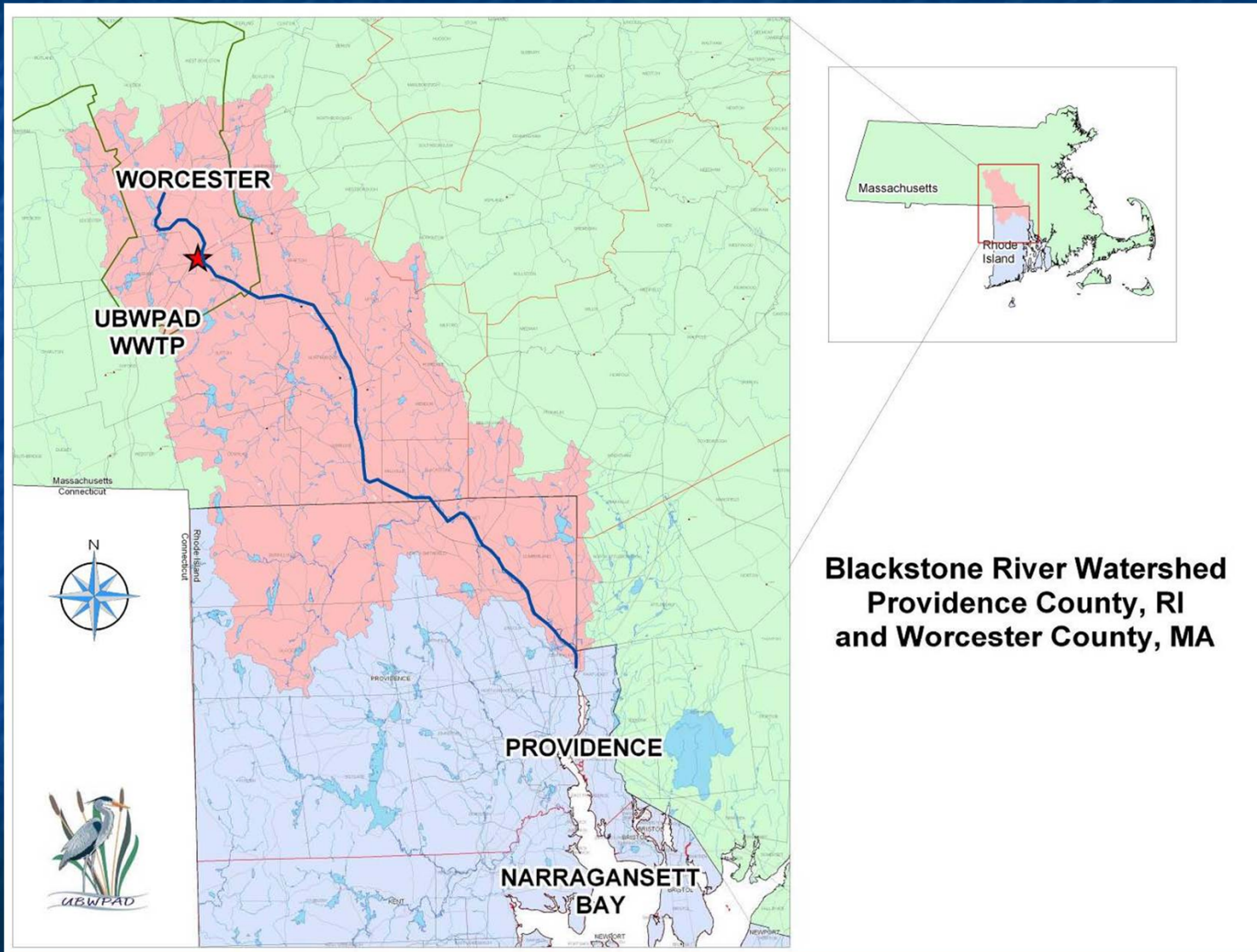
Upper Blackstone Water Pollution
Abatement District

Tom Walsh

Narragansett Bay Commission Symposium

June 16, 2011

Location



OUTLINE

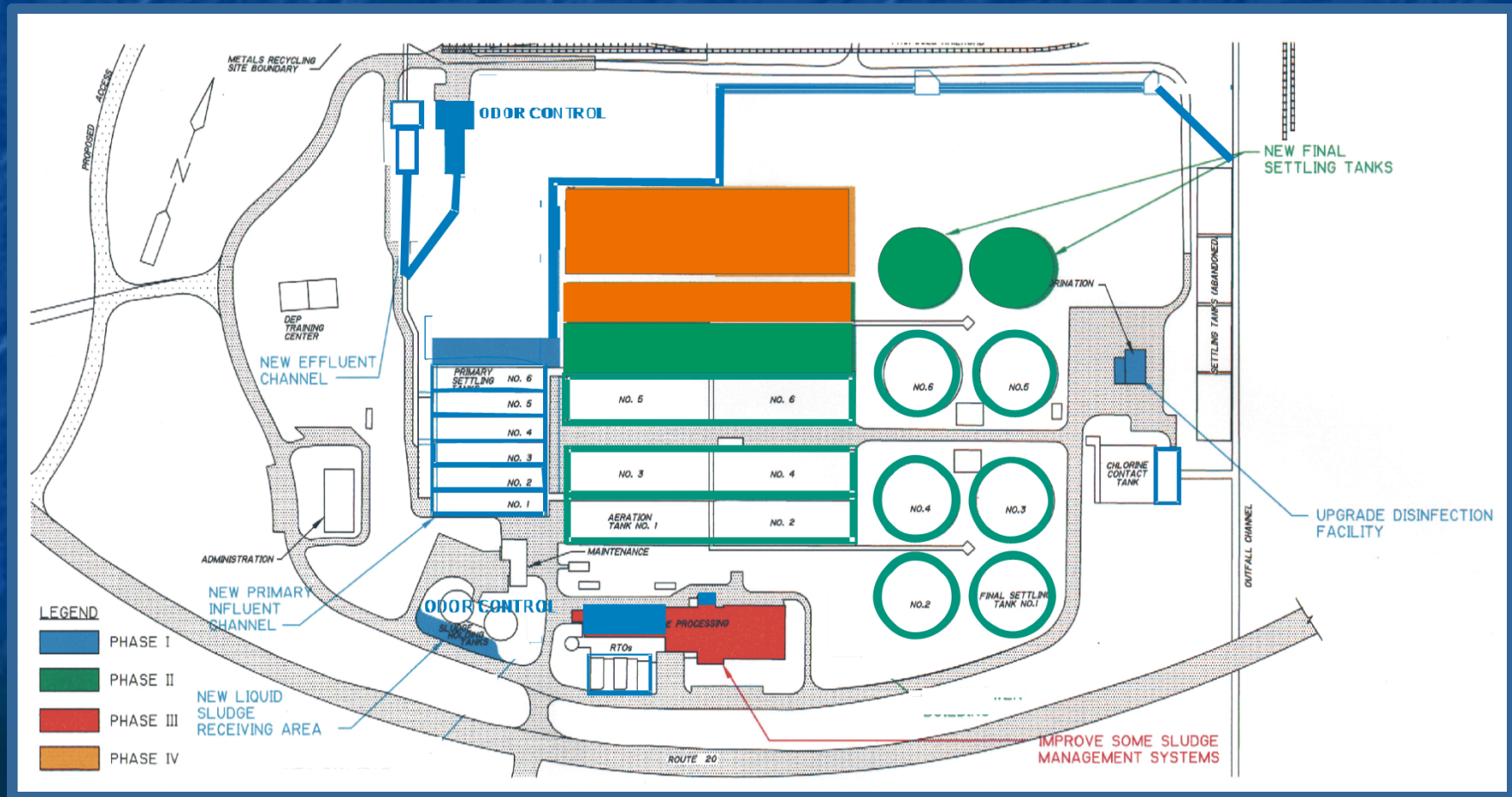
- Permit & Processes
- Current Performance
- Performance Limitations
- Performance Enhancements
- Current Energy & Chemical Use
- Resource Needs for 2008 Permit

NPDES Permits

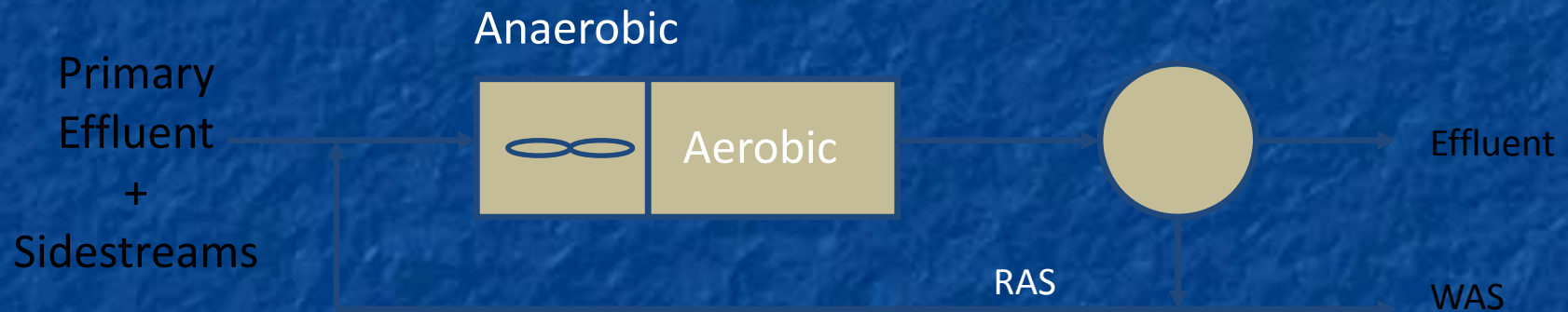
		2001 Permit	2008 Permit
Total Phosphorus	April - Oct	0.75	0.1
	Nov - Mar	Report	1
Total Nitrogen	May - Oct	No Limit	5
	Nov - April	No Limit	Report



4 Phased Plant Improvement Project



A/O for BP Reduction and Nitrification



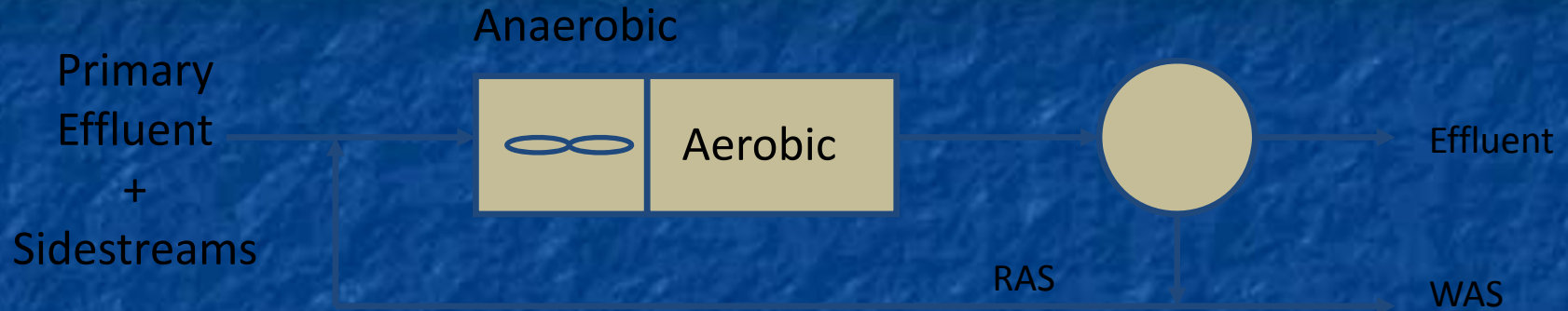
Nitrification:

Ammonia \longrightarrow Nitrates
Using Oxygen and Alkalinity

Denitrification:

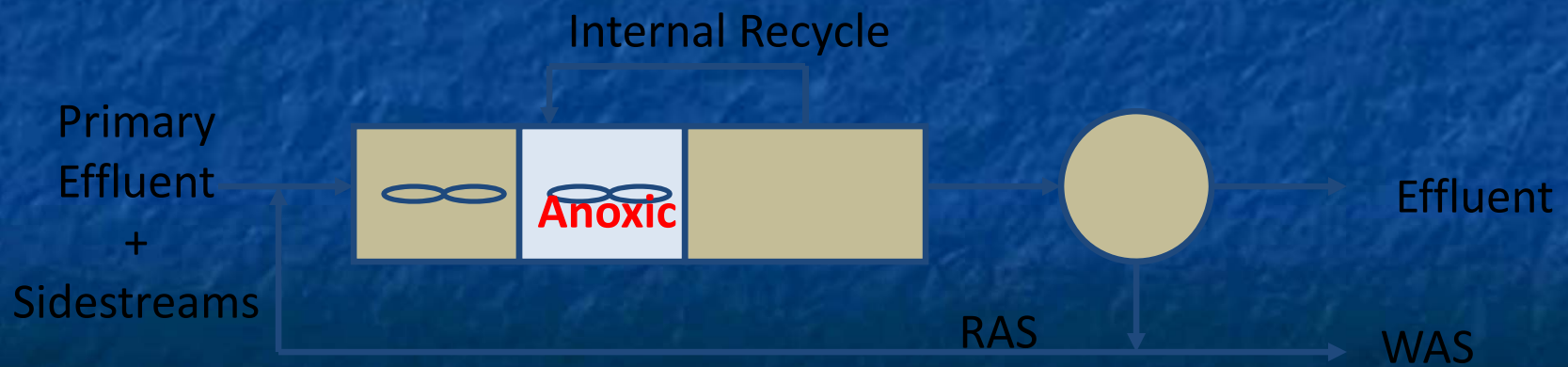
Nitrates \longrightarrow Nitrogen gas
Releasing Oxygen and Alkalinity

A/O



A²/O

TP + TN Removal

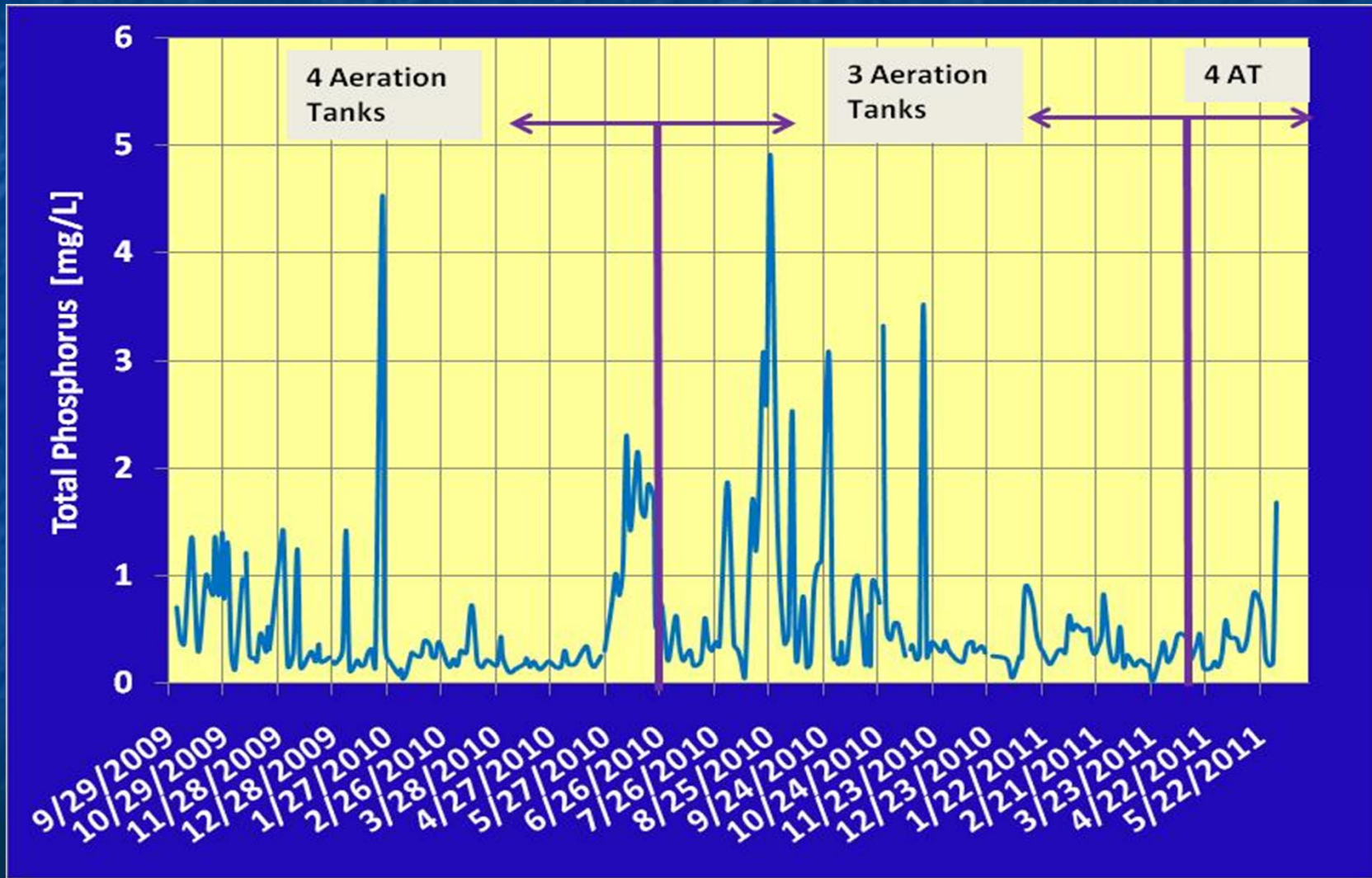


Returns Oxygen & Alkalinity

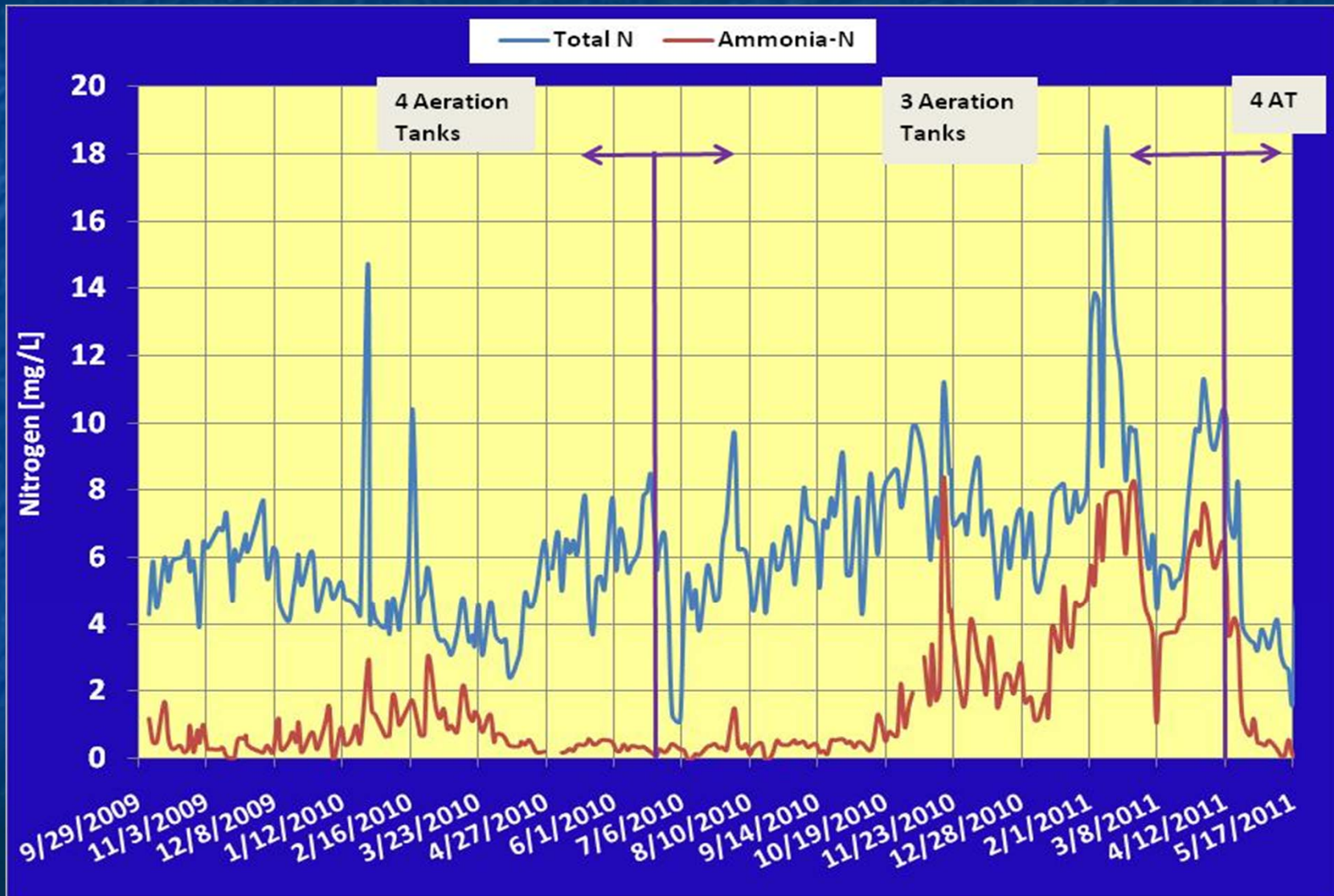
Current Plant

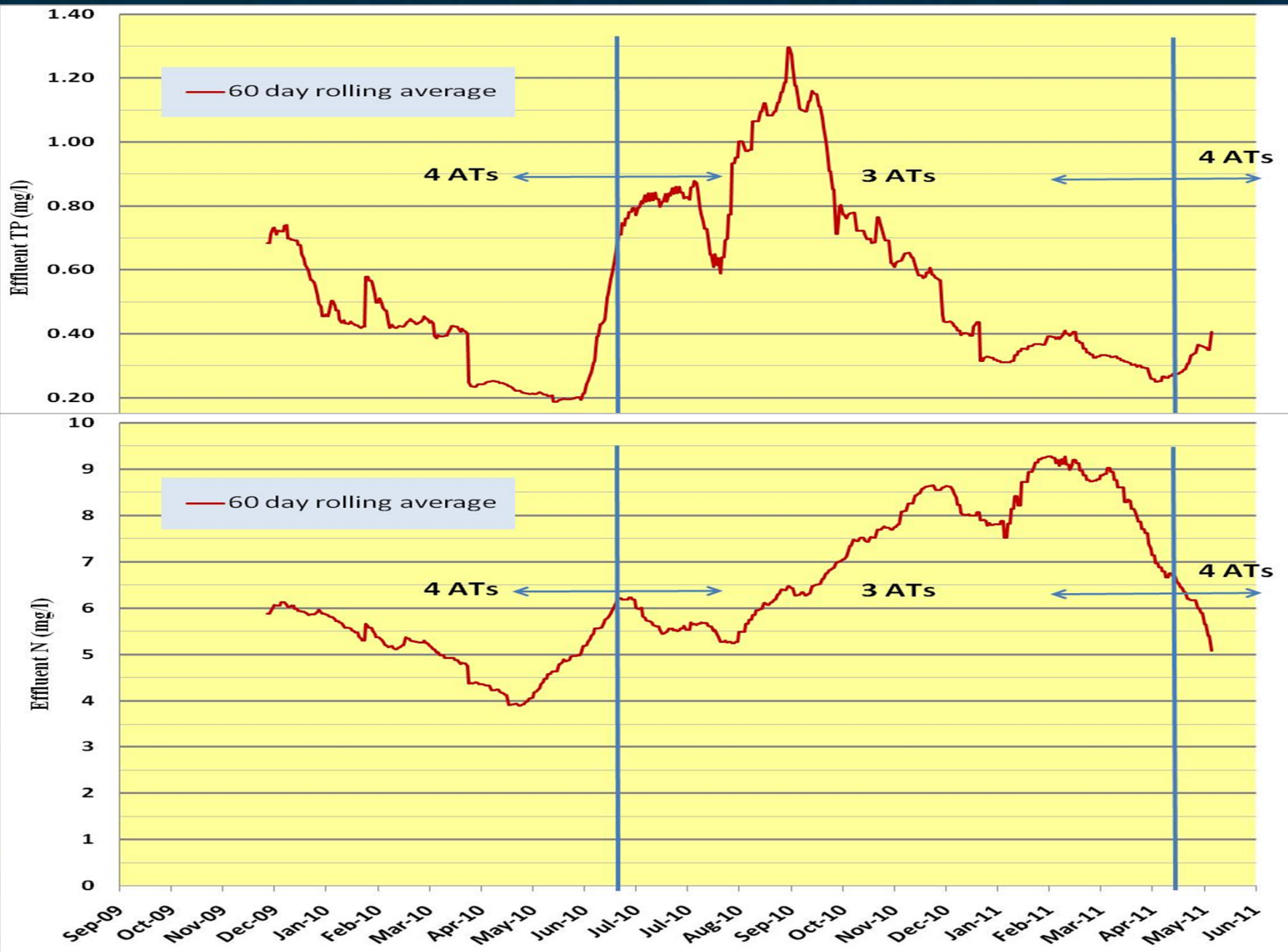


Total Phosphorus



Ammonia & Total Nitrogen

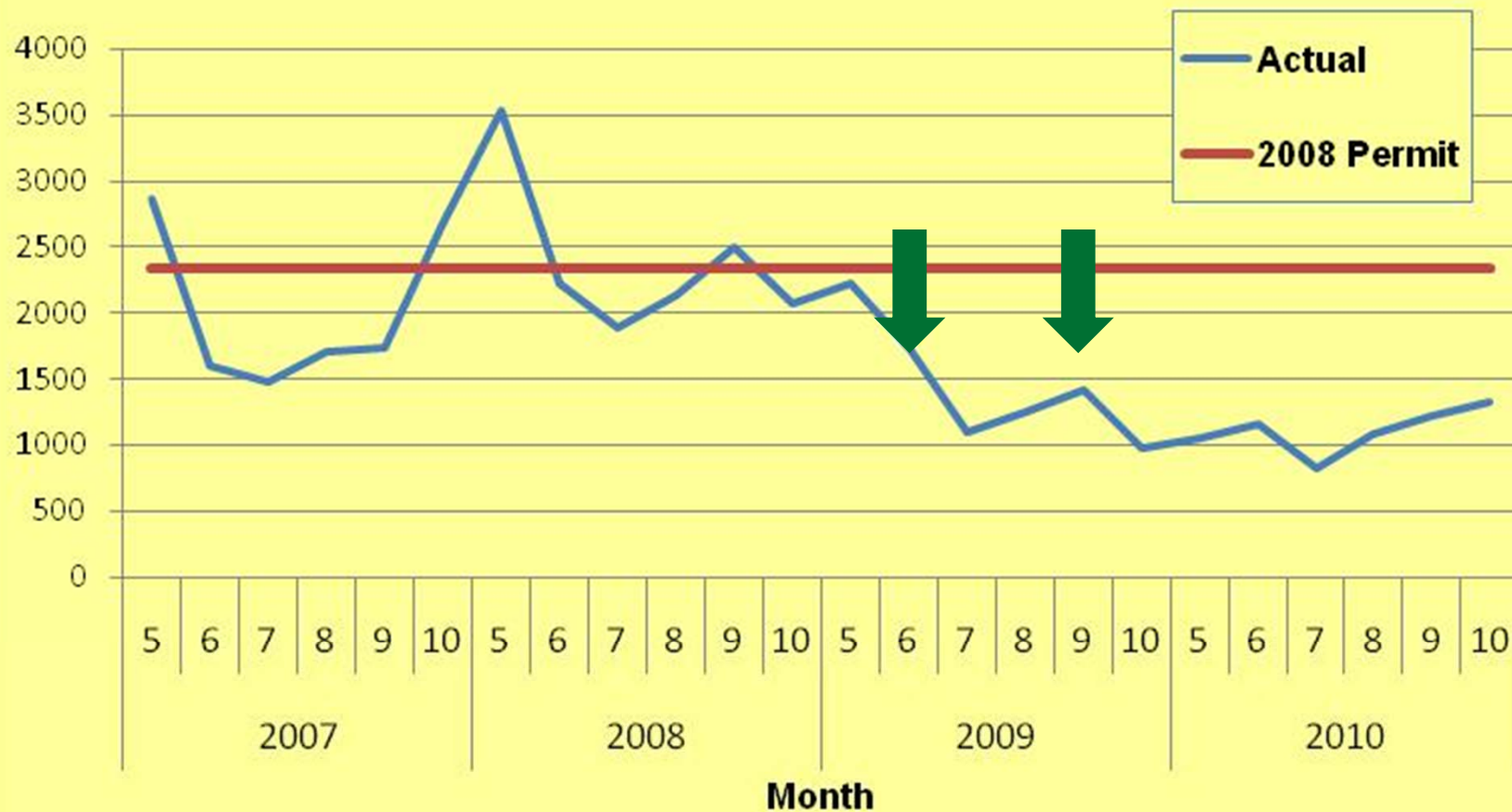




Total Phosphorus Load Since Startup of Advanced Treatment Facilities



Average Daily Pounds of Nitrogen in UBWPAD Effluent

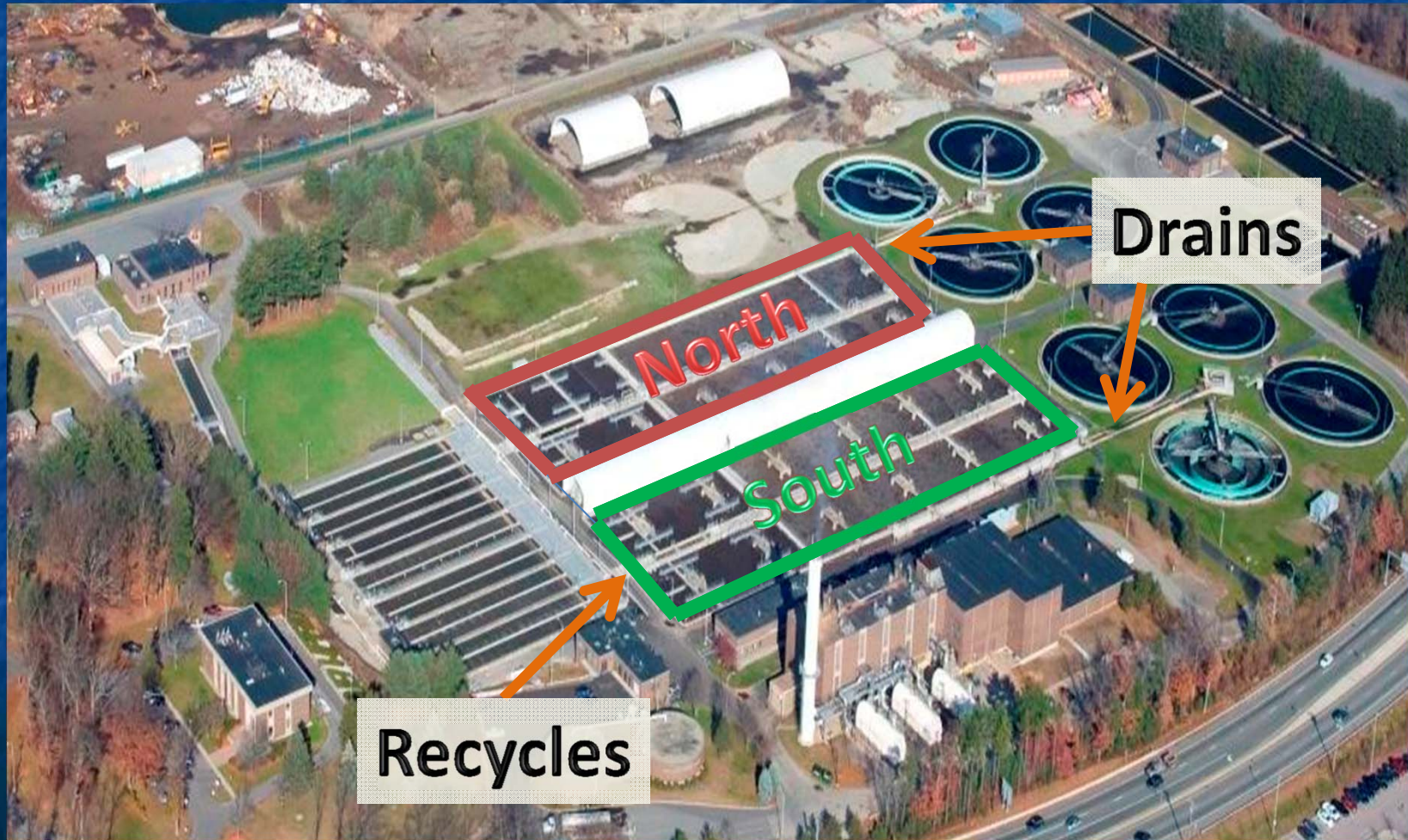


Permits & Performance

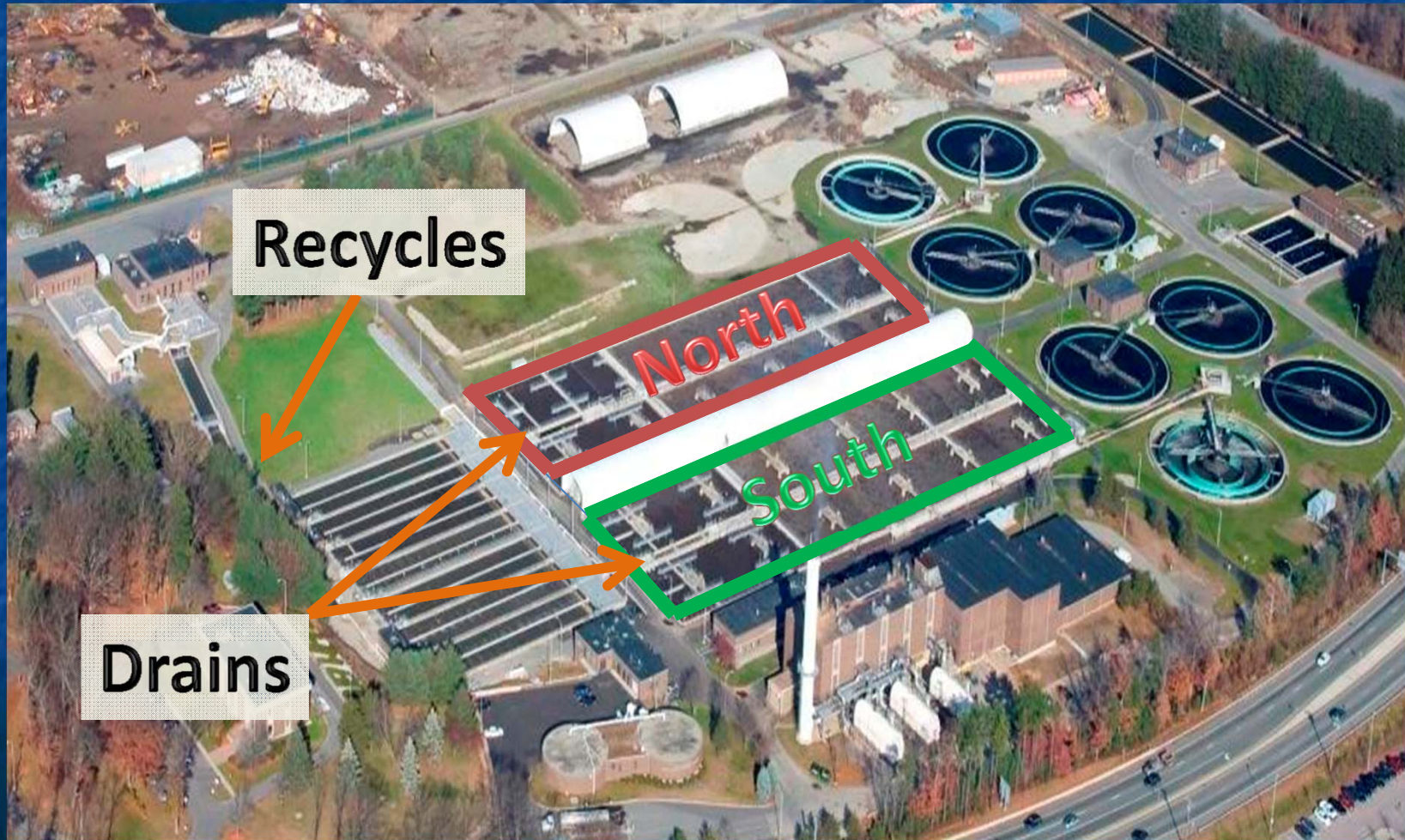
		2001 Permit	Design	Performance ⁽¹⁾	2008 Permit
T P	Apr - Oct	0.75	0.6	0.69	0.1
	Nov - Mar	Report	none	0.40	1.0
T N	May - Oct	No Limit	8 - 10	5.74	5.0
	Nov - Apr	No Limit	8 - 10	6.56	Report

(1) Performance values are average since startup.

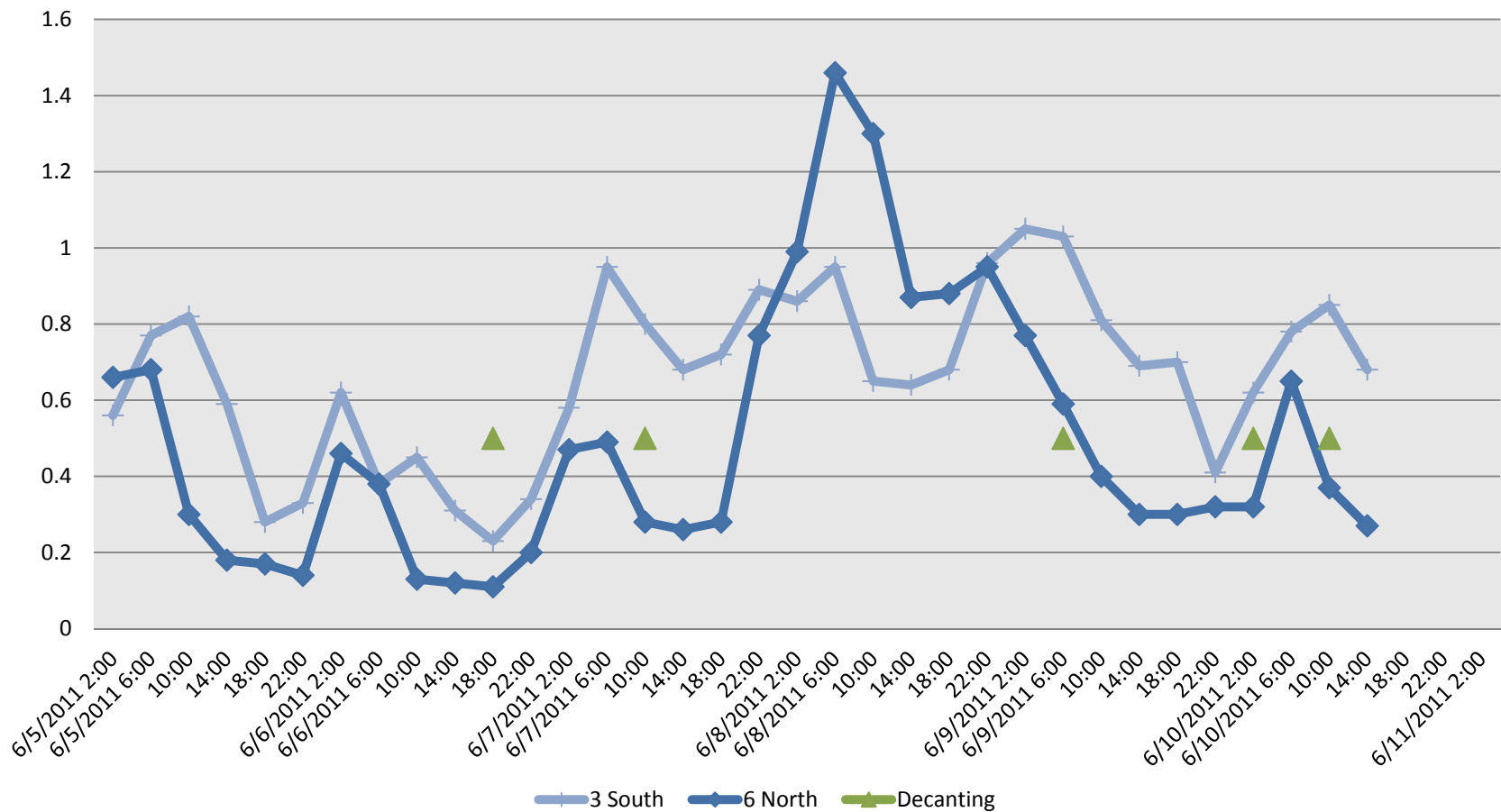
Performance Limits



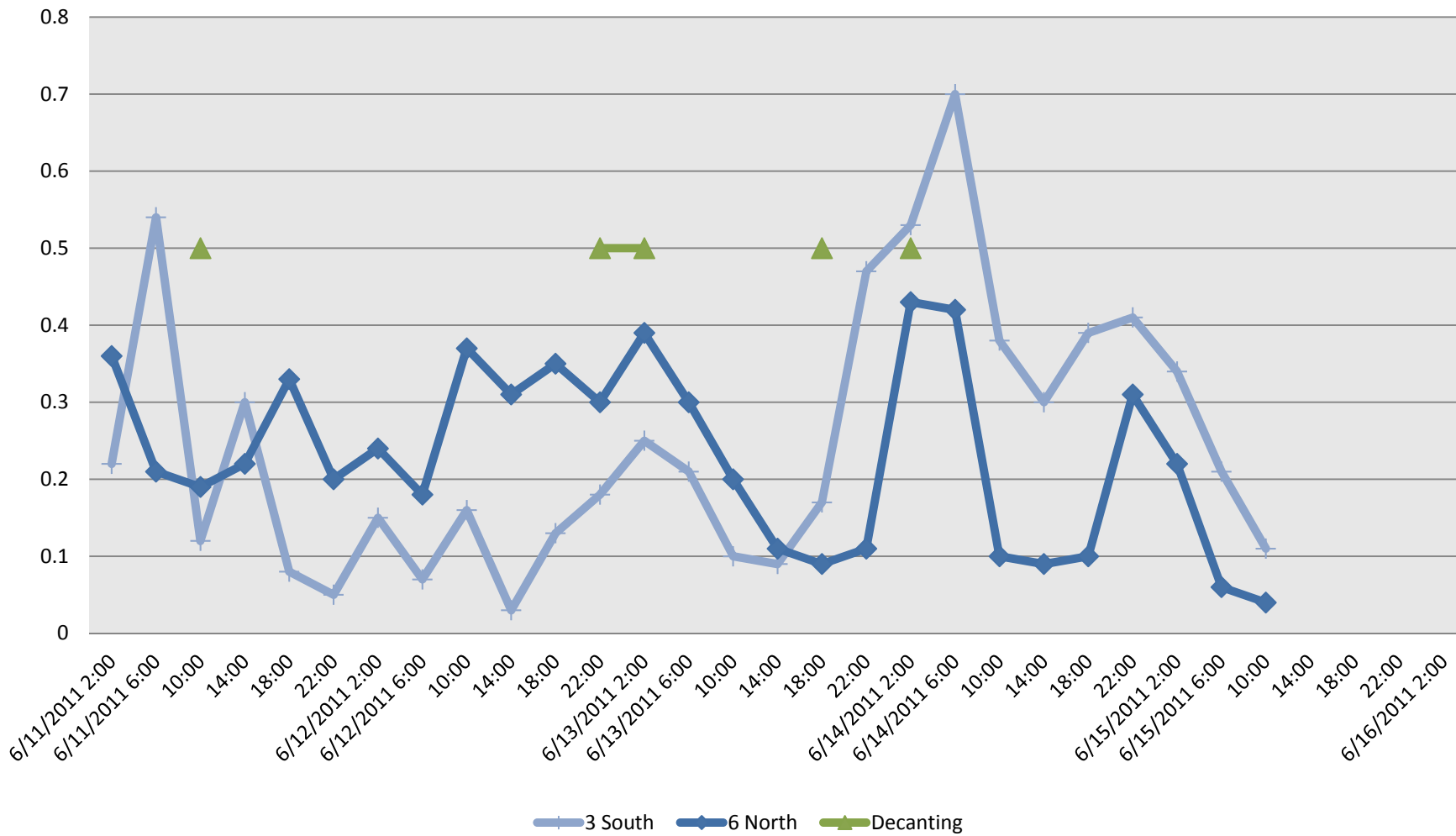
Performance Improvements



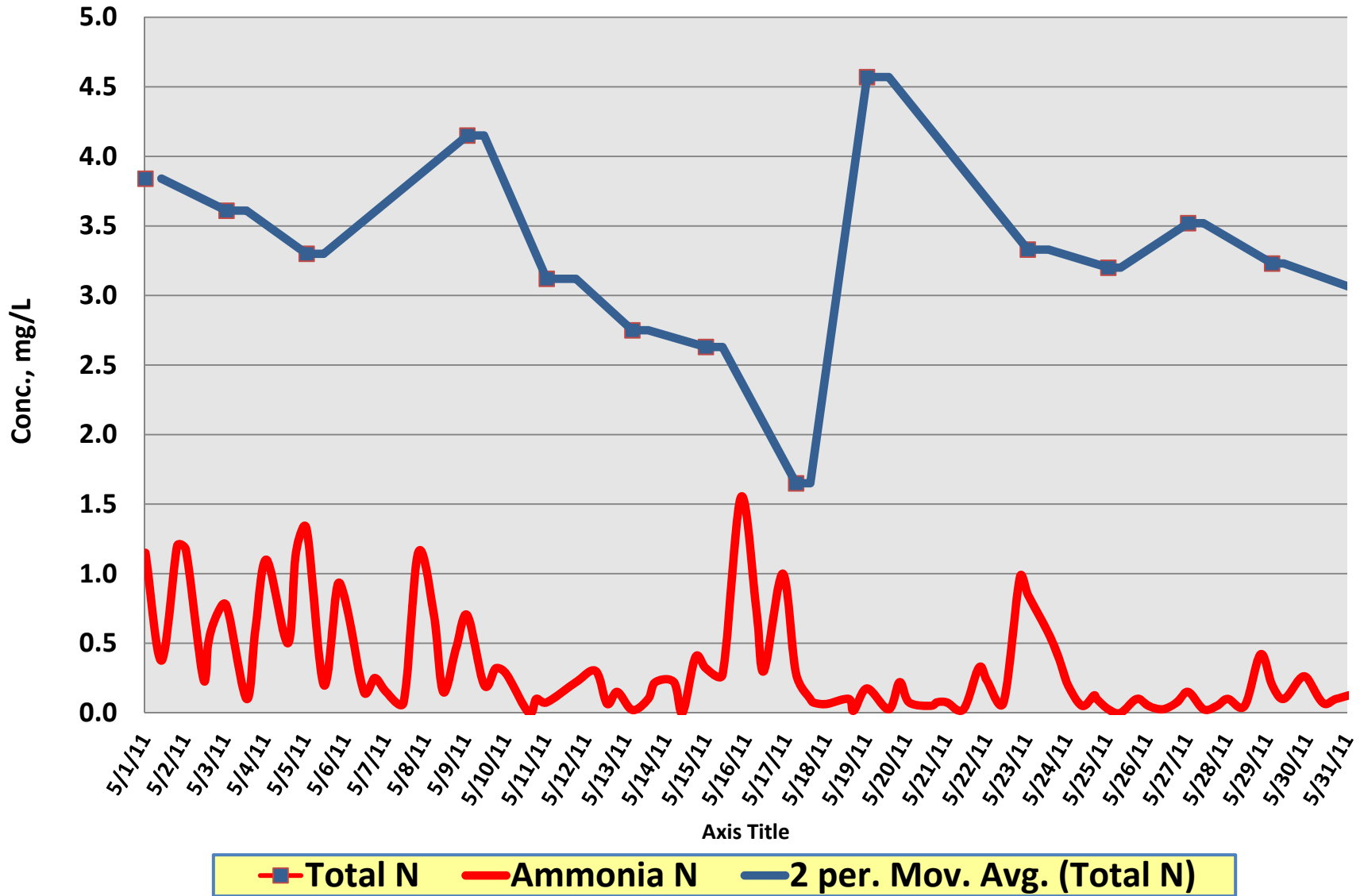
Ortho Phosphate June 5- 10 A20 mode



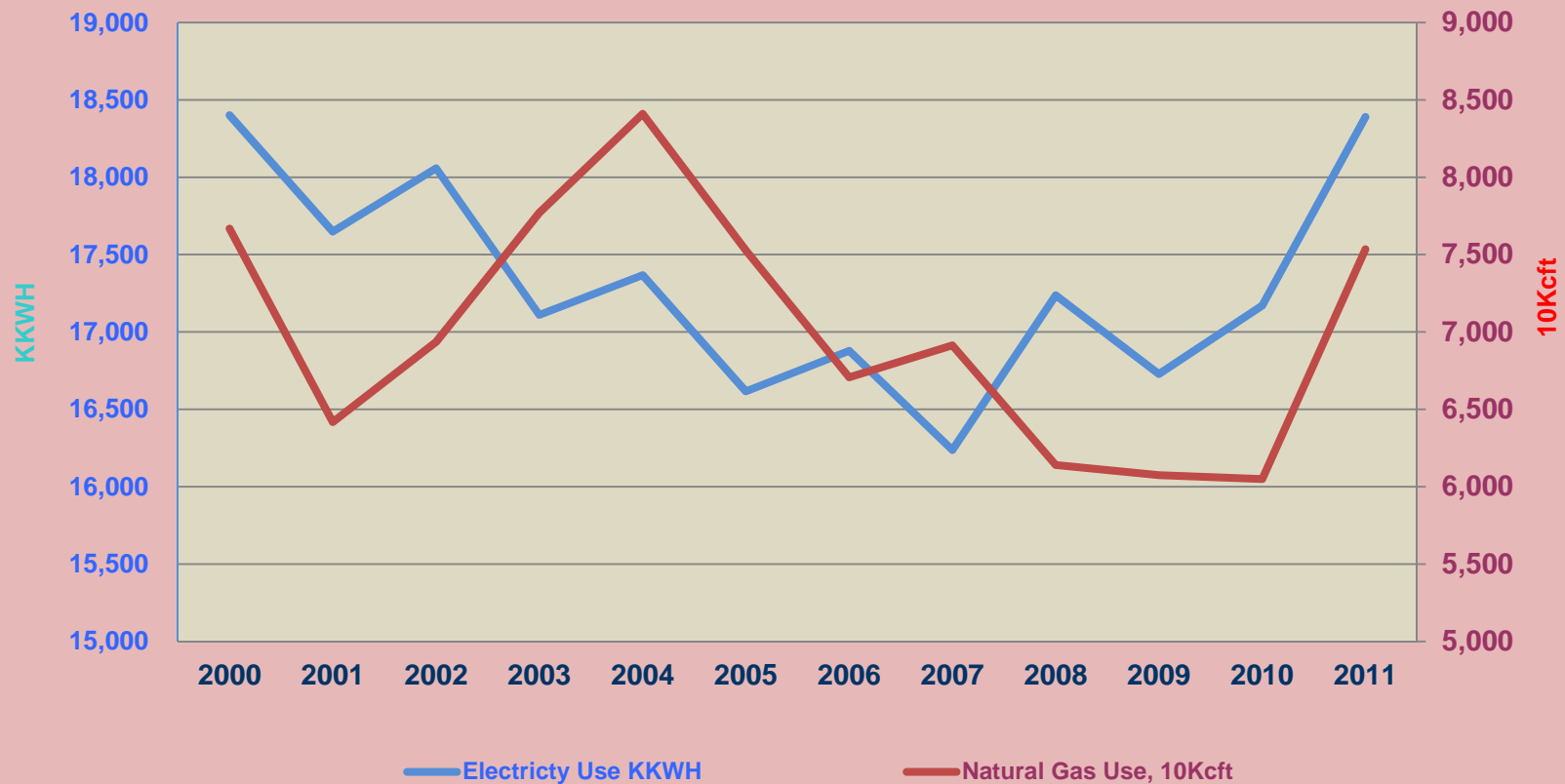
Ortho Phosphate June 11 - 15 A20 mode



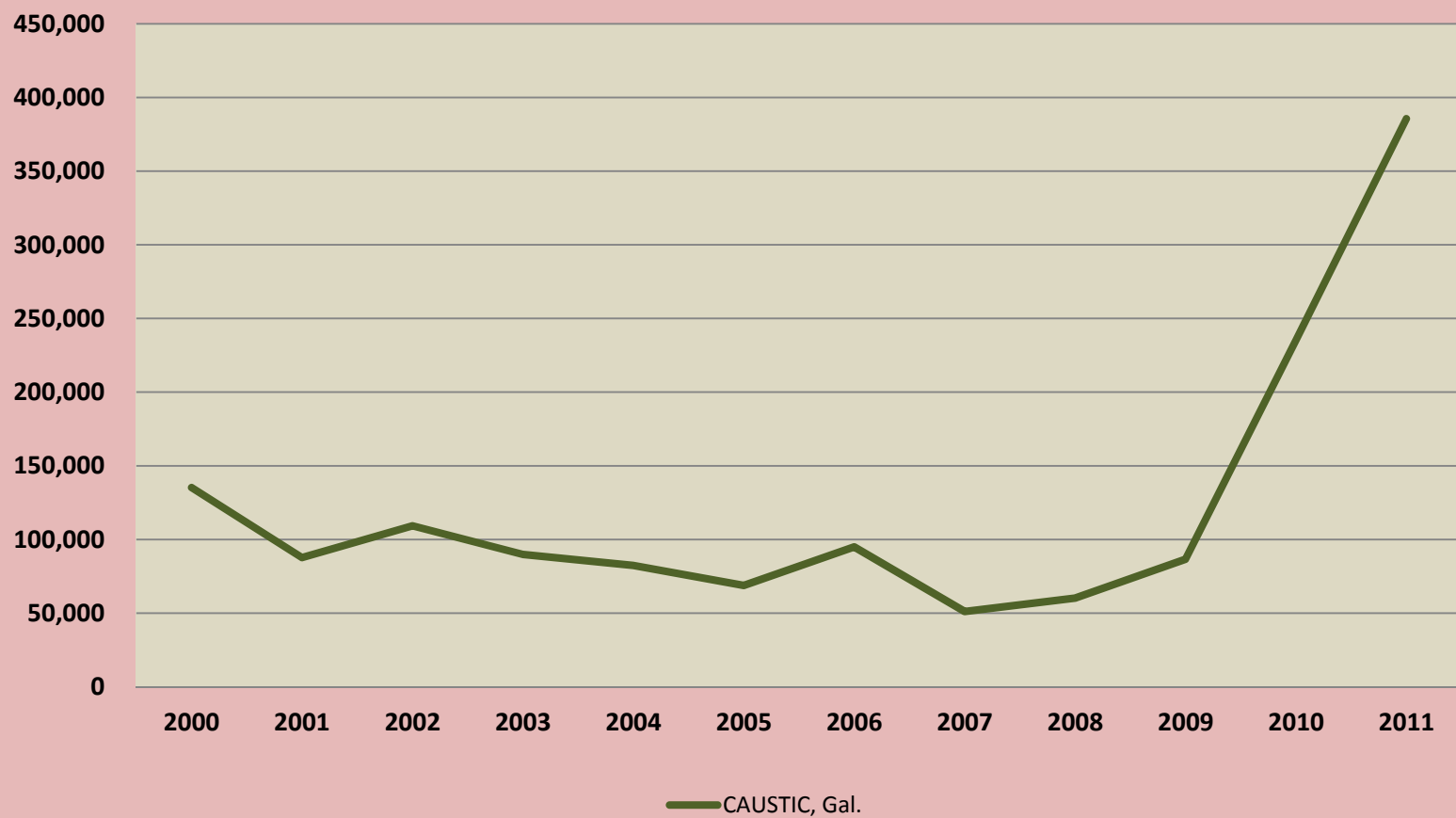
Nitrogen



Annual Energy Consumption



Sodium Hydroxide Use



Revised Treatment Processes to Achieve 2008 Permit

- Conversion to Modified Bardenpho Process
 - For N removal
 - Requires additional aeration tanks
 - **Methanol addition**
- High Rate Clarification or filtration for TP
 - Multi-point chemical addition with ferric chloride
 - Intermediate pumping

Resource Needs – 2008 Permit

- 8,162,000 gallons of Sodium Hydroxide
- 3,000,000 kWh *more* electricity annually,
 - enough to power 600 homes;
 - enough to generate 4,650,000 pounds of CO₂
- 20,600,000 *more* cubic feet of natural gas
 - enough to heat 500 homes
 - enough to increase NO_x emissions by 14%
- 1,825,000 gallons of ferric chloride
- 150,000 gallons of methanol

